

PORCUPINE CREEK LAND SYSTEM

Along the eastern margins of the Heytesbury Project area, are found undulating to rolling landscapes which are dominated by the presence of infertile marine sands. This land system is quite extensive in the upper reaches of the Gellibrand River catchment but only three fairly small separate areas have been mapped in this study area. The two areas to the east of Princetown are effectively very similar and will be treated as being identical. The third area is in the north of the study area along the upper reaches of Tomahawk Creek. All of these areas and also the other parts of the land system outside the present study area have different arrangements of the six separate components, but the overall potential uses and hazards of the landscapes are very similar.

Common to all these areas are sources of in situ marine sand. At the exposures of this sand, soils of components 1 and 2 have developed. They are typical of the soils found elsewhere on exposures of marine sand found closer to the Otway Ranges. In the areas to the east of Princetown, most of these in situ exposures of unconsolidated marine sand have grey sand soils with hardpans developed on them. Thus component 2 dominates these exposures although some areas of the better drained component 1 soils are found. In the other area near Tomahawk Creek, the exposures are of very limited occurrence but again component 2 is more common. These soils are naturally quite infertile, have high surface soil acidities with pH values between 4 and 4 ½ and quickly dry out in summer to induce moisture stresses on the vegetation that manages to grow on these sites.

Over most of the landscapes however, the most commonly encountered soils are those of components 3, 4 and 5. These soils are of polygenetic origin and their widespread occurrence is the distinguishing feature of this land system. During previous erosional cycles the in situ beds of unconsolidated marine sand have provided the source for the distribution of veneers of sand over the adjacent lower parts of the landscape. This sand material has been subsequently weathered and leached so that iron oxides and humic acids have been migrated down to the surface horizon of the older soils below. Cementation by these organic acids and iron has resulted in the formation of hardpan layers in what was formerly part of the solum of the buried relict soil below the sand veneer. The hardpan are normally about 20 cm thick and below this are found invariably structured and mottled clays of the B horizons of the relict soils. These hardpan layers impede water movement through the profile so that internal drainage of the soil is slow. The natural vegetation is thus limited to species tolerant of waterlogging in winter with possibilities of moisture stresses in the loamy sand surface horizons in summer.

The position in the landscape of each of components 3, 4 and 5 is essentially a property of the clay underlay or remnant of the relict soil below the sand veneer. This position and the resulting slope has in turn determined the proneness of the soil to waterlogging. Thus there is a strong correlation between the vegetative association and the nature of the clay beneath the hardpan and this has been the basis for separating these three components.

Component 3 possesses clay underlays whose structures, textures and colours are identical to the B horizons of the mottled yellow and red fine structured gradational soils so often encountered in neighbouring land systems. The properties of good stability but low fertility also applies to these polygenetic equivalents in this land system. They are generally found on very gentle slopes on the upper parts of the landscape that have escaped dissection for long periods of time. As such drainage of these soils is poor and the vegetation is usually restricted to shrub layers of waterlogging tolerant species with occasional peppermints and swamp gum in an open woodland formation. Component 3 is commonly encountered in the Tomahawk Creek area, but is absent from the Princetown areas.

Component 4 possesses clay underlays with yellow and grey mottled clays, weak structures and sandy clay textures. They belong to much younger profiles than those of the previous component and have not been so intensively weathered and leached as those of component 3. As such they usually have comparatively higher levels of plant nutrients in the root zone. The slopes on which they have occurred are generally steeper than those of component 3 and site drainage is improved. Native vegetation is usually a woodland about 15 metres average height with narrow leaved peppermint, shining peppermint and swamp gum dominating the association. In the Princetown areas this component is found on most parts of the landscape and scent bark joins the vegetative association. Elsewhere this component is often present as the erosional scarp of the remnants of mottled yellow and red fine structured clay underlays where stream dissection has removed these older parts of the landscape. As such it is only a minor component of the landscape.

Component 5 soils have clay underlays with yellow and grey mottles, medium to heavy clay textures and coarse structures. They are usually found on landforms which are high level river terraces. The degree of cementation of the hardpan is extremely variable as is also the depth of sand material washed over the top of the profile. Correspondingly the vegetative formation ranges from open forests to closed scrub depending on just how severe the restriction is to drainage caused by the hardpan layers.

Most of the drainage lines in the land system are broad and gentle so that drainage is slow. Soils are normally peaty sandy loams with surface textures being dominated by organic matter. The acidity of these peats is often very high and the water table is usually at the surface at the surface in winter and spring thus rendering them unsuitable for pasture establishment. The value of these peats in maintaining perennality of the creeks which run through them is very high as many of these areas are within domestic water supply catchments which don't have storage reservoirs.

The climate over these areas is generally quite favourable for long periods of plant growth. Moisture stresses are however frequently encountered during the period when precipitation is less than potential evapotranspiration due to the low moisture holding capacity of the loamy sand surface horizons. This, combined with the low fertility and the frequently encountered bad winter drainage of many of these soils, makes the land system fairly marginal for agricultural uses. These areas do not offer the same economic incentives for dairy farming as do adjacent land systems and it is unlikely that they will ever be managed intensively for agriculture. It also appears likely that some of these areas may be used for conversion to pine plantations by the Forests Commission. Pines generally do not react favourably to winter impeding layers within 50 cm of the surface of the soil and so careful investigation will be needed if any parts of this land system are suitable for pine establishment. Some occasional scars exist where previous sand and gravel extraction pits (hardpan layers of component 2 soils have in places been mined) have not been properly reclaimed for natural revegetation to occur.

In general, no further development of these areas for production seems at present economical and they should generally be kept in their natural state to maintain nature conservation and water supply catchment values where appropriate.

Pocupine Creek Land System

AREA: 20 km²

Component	1	2	3	4	5	6	
Proportion %	30	25	15	15	4	10	
Climate	Rainfall mm	Annual: 800 – 100 Monthly Range: 40 (Jan) – 120 (Aug)					
	Temperature °C Seasonal Growth Factors	Annual: 12.5 Monthly Range: 8.0 – 18.0 Period When Average Monthly Temperature < 10°C June – August Period When Precipitation < Potential Evapotranspiration: Late October – March					
Geology	Age	Paleocene Unconsolidated Marine Sands		Paleocene Unconsolidated Marine Clays, Sands & Silts			
	Lithology						
Topography	Landscape	Undulating plain					
	Elevation M	60 – 230					
	Local Relief M	45					
	Drainage Pattern	Trellis					
	Drainage Density Km/Km²	3.8					
	Landform	Hills			Terrace	Drainage Line	
	Position	Crests, slopes	Upper slopes	Mid slopes	Lower slopes		
	Average Slope (Range)	21% (9% - 38%)	9% (2% - 21%)	5% (2% - 11%)	16% (5% - 33%)	2% (0% - 5%)	0% (0% - 1%)
	Slope Shape	Convex	Convex	Linear	Convex	Linear	Linear
Native Veg	Structure Dominant Stratum	Woodland	Low woodland	Open woodland	Woodland	Open forest	Closed scrub
	Species	Narrow Leaved Peppermint, Shining Peppermint	Narrow Leaved Peppermint, Shining Pepper-Mint, Occasional Brown Stringybark	Narrow Leaved Peppermint, Shining Peppermint Occasional Swamp Gum	Narrow Leaved Peppermint, Shining Peppermint, Swamp Gum	Swamp Gum, Manna Gum, Narrow Leaved Peppermint, Brown Stringybark, Occasional Messmate Occasional Scent Bark	Scented paperbark, black sheoak, common aotu-s, occasional swamp gum
	Other Common Species	Blackboys, Prickly Tea Tree, Smooth Parrot Pea Silver Banksia	Prickly Tea Tree, Scented Paperbark Black Sheoak	Black Sheoak Prickly Tea Tree	Prickly Tea Tree, Common Heath	Prickly Moses, Prickly Tea Tree, Black Sheoak, Rapier Sedge	Coral fern, swamp heaths, swamp clubmoss
Soil	Parent Material	Unconsolidated sands	Unconsolidated sands	Colluvial sand on unconsolidated clays & soils	Colluvial sand on unconsolidated silts, sand & clays	Colluvial sand on alluvial clays, silts & sands	Plant remains alluvial sand, silt & clay
	Group	Grey sand soils uniform text.	Grey sand soil w/h hardpan uniform text.	Grey sand soils, compact clay underlay	Grey sand soils compact clay underlay	Grey sand soils compact clay underlay	Peaty sands
	Surface Texture	Loamy Sand	Loamy Sand	Sandy Loam	Sandy Loam	Sandy Loam	Silty loam
	Permeability	Extremely Rapid	Very Slow	Very Slow	Slow	Very Slow	Rapid
	Av. depth M	> 2	0.8	> 2	> 2	> 2	> 2
	Northcote Class	Uc 2.31	Uc 4.33				0
Land Use	Uncleared area: nature conservation, town water supply protection, sand & gravel extraction Minor cleared areas: beef cattle grazing						
Hazards Of Soil Deterioration	Moderate-severe hazard of sheet erosion on the steeper slopes				Mod. haz. of waterlogging & soil pumping		
Management Practices For Soil Conservation	Maintenance of adequate ground cover at all times of the year. Wintering of stock away from badly drained areas. Establishment of deep rooted perennial pasture species if developed for agriculture (liming often required for germination). Revegetation of disused gravel extraction sites with indigenous species. Replacement of topsoil over extraction site.						